DOCUMENT RESUME

ED 415 228 SP 037 744

AUTHOR	Ingersoll, Richard M.
TITLE	Teacher Shortages and Teacher Quality.
PUB DATE	1994-00-00
NOTE	9p.; Paper presented at the Annual Meeting of the American Statistical Association (1994).
PUB TYPE	Reports - Research (143) -- Speeches/Meeting Papers (150)
EDRS PRICE	MF01/PC01 Plus Postage.
DESCRIPTORS	Personnel Selection; Private Schools; Public Schools; *Secondary Education; *Secondary School Teachers; *Teacher Competencies; *Teacher Effectiveness; *Teacher Qualifications; *Teacher Supply and Demand
IDENTIFIERS	*Out of Field Teacher Assignment; Schools and Staffing Survey (NCES)

ABSTRACT

This study investigates shortages of qualified U.S. secondary teachers using data from the 1991 Schools and Staffing Survey (SASS), a nationally representative study conducted by the National Center for Education Statistics. The SASS includes four sets of integrated questionnaires: a school survey, central district survey, principal survey, and teacher survey. This study involved data from 25,079 secondary teachers from 3,724 public and 465 private schools, examining levels and variations in out-of-field teaching. Preliminary results suggest that demand for teachers is on the rise. Reserve pools of teachers are large, but schools have been able to fill available teaching positions at the expense of minimal teacher qualifications. About half of the principals report difficulties filling vacancies. Typical coping strategies include eliminating positions, increasing supplies of certain types of teachers, filling positions with underqualified candidates, assigning other teachers, and using substitutes. While most secondary teachers have substantial training in the main field in which they teach, large numbers teach additional courses in fields for which they do not have at least a college minor. Levels of out-of-field teaching vary substantially by field, with the highest proportion in mathematics (30 percent). There are distinct differences among schools. Small schools, private schools, and schools with high proportions of poor students have higher levels of out-of-field teaching. (Contains 4 tables and 25 references.) (SM)

****
* Reproductions supplied by EDRS are the best that can be made *
* from the original document. *
****

ED 415 228

TEACHER SHORTAGES AND TEACHER QUALITY[1]

By

Richard M. Ingersoll
Department of Sociology
Baldwin Hall
University of Georgia
Athens, GA 30602

PERMISSION TO REPRODUCE AND DISSEMINATE THIS MATERIAL HAS BEEN GRANTED BY

R. M. Ingersoll

TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)

1

U.S. DEPARTMENT OF EDUCATION
Office of Educational Research and Improvement
EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)

☐ This document has been reproduced as received from the person or organization originating it.

☐ Minor changes have been made to improve reproduction quality.

• Points of view or opinions stated in this document do not necessarily represent official OERI position or policy.

[1] This paper was presented at the 1994 Annual Meeting of the American Statistical Association and appeared in the 1994 *Proceedings of the American Statistical Association*. It draws from a larger research project on the supply, demand and quality of teachers in the U.S., sponsored by the National Center for Education Statistics (contract number RN93140001) of the U.S. Department of Education. This paper does not constitute an official NCES publication; the views expressed are solely those of the author.

SB 37744

BEST COPY AVAILABLE

Abstract

Education policy research over the past decade is marked by substantial disagreement over the extent to which there are shortages in the supply of qualified school teachers in the U.S. This study addresses this debate by examining national data on an important indicator of teacher shortages - the extent to which schools employ underqualified teachers.

The data come from the 1991 Schools and Staffing Survey - a nationally representative study conducted by the National Center for Education Statistics of the U.S. Department of Education. The sample consists of 25,079 secondary school teachers from 3724 public and 465 private schools. This investigation focusses on levels and variations in out-of-field teaching - teachers teaching in fields for which they do not have adequate training.

Preliminary results indicate that while most secondary school teachers have substantial training in the main field in which they teach, large numbers of teachers teach additional courses in fields for which they do not have at least a college minor. These levels of out-of-field teaching vary substantially by field, with the highest proportion in mathematics (30%). The data also indicate that there are distinct differences among schools. Private schools, in particular, have higher levels of out-of-field teaching.

Key Words: teacher shortage, teacher quality, SASS

Introduction

Beginning in the early 1980s, a series of highly publicized reports focussed national attention on the imminent possibility of widespread shortages of elementary and secondary school teachers in the U.S. (e.g. Darling-Hammond 1984; Good and Hinkel 1983; National Commission on Excellence in Education 1983). These predictions came as a complete surprise to many. Throughout much of the 1970s, there had appeared to be a surplus of school teachers. Indeed, reductions in the teaching force through layoffs had been common to many schools and districts in the U.S. But the new research on teacher supply and demand made a compelling case that through the 1980s teacher supply would drastically decrease, while demand for new teachers would steadily increase, resulting in shortages.

The shortage argument was that fewer and less qualified college graduates were choosing to teach, while more children of the "baby boom" generation were entering the school system, driving enrollments and, hence, hiring up. Moreover, a growing imbalance between supply and demand would be exacerbated, according to this view, because of problems of teacher retention. A high level of teacher attrition, these analysts argued, was a large source of demand for new teachers and a key factor behind the predicted shortages (e.g. Grissmer and Kirby 1987; Murnane et al. 1992; National Academy of Sciences 1987).

These reports arrived in a context of widespread concern and criticism surrounding the adequacy of the elementary and secondary school system as a whole. Critics linked declining U.S. economic performance, especially in the international arena, to declining school performance (National Commission on Excellence in Education 1983). The apparent inability of schools to attract and retain qualified teachers appeared to be one more in a host of symptoms of the "crisis" besetting schools. As a result, the imminent possibility of teacher shortages gained widespread coverage in the national media.

The education research community was, however, not unanimous in its assessment of the threat of teacher shortages. Several analysts argued that teacher supply was and would continue to be adequate and that attrition was not particularly high (e.g. Feistritzer 1986). A study of Indiana conducted in the late 1980s seemed to provide empirical support for these arguments. It suggested that teacher supply was up, due to increased re-entry of former teachers and that attrition was actually at its lowest point in years, due to a stable work force and a decline in turnover among new teachers and women (Grissmer and Kirby 1992).

As a result of these contradictory claims, since the late 1980s there has been widespread confusion about whether teacher shortages have been or will be a reality and education policymakers have not known what to believe. One source of the confusion and irresolution, almost all involved have agreed, has been a lack of data, especially at the national level, on the disputed phenomena: the demand for teachers, the supply of teachers and the gap between the two (e.g. Darling-Hammond and Hudson 1990; Haggstrom et al. 1988; Boe and Gilford 1992).

In order to address these shortcomings, the National Center for Education Statistics (NCES), the statistical agency of the U.S. Department of Education, fielded a major new survey of schools and teachers in the late 1980s - the Schools and Staffing Survey (SASS). This paper presents data from SASS that directly address the debate as to whether there are shortages of teachers in the U.S. The story they tell is both provocative and unsettling. In brief, our analysis suggests that there has not been shortages in the quantity of available elementary and secondary school teachers in this country. But, our analysis suggests there have been, in fact, distinct inadequacies in how well schools are staffed. Schools have filled teaching positions, but only at the expense of minimal standards of teacher qualification. The result: teacher quality has been sacrificed for teacher quantity.[1]

Data

The Schools and Staffing Survey is the largest and most comprehensive data source available on the staffing, occupational and organizational aspects of schools in the U.S. It includes a wide range of information on the characteristics, work, and attitudes of school faculty, and on the characteristics of a nationally representative sample of schools and districts. SASS was designed to be administered triennially; at this point two waves are available - for the 1987-88 and 1990-91 school years.[2]

SASS includes four sets of integrated questionnaires: a school survey; a central district office survey for public schools; a principal survey, and a teacher survey.

Response rates have been high, ranging from about 84 percent for private school teachers to 95 percent for public school administrators. The samples utilized in this analysis contain about 4,800 public school districts, 9,000 public schools, 2,600 private schools, 46,700 public school teachers, and 6,600 private school teachers. All of the data reported here are weighted to be representative of the national population of teachers and schools in the year of the survey.

The 1987-88 and 1990-91 waves of SASS obtained a rich array of information on issues at the heart of the shortage debate: the numbers of and fields of teaching position vacancies in schools; the degree to which schools experienced difficulties in filling vacancies; the numbers of unfilled positions; the methods that schools used to respond to difficulties in filling vacancies; the sources of new teachers; the background, characteristics, qualifications and assignments of newly hired and already employed teachers. In order to provide context, I also utilize selected data from several other NCES surveys and reports.

Results

Shortages of teachers, most simply put, occur where demand, or the number of teaching positions funded, outstrips supply, or the number of teachers available. Analyses of shortages then must begin by assessing demand and supply.

Demand for teachers appears to be on the rise. After a decade and a half of decline, since the mid 1980s school enrollments have steadily increased and are projected to continue to do so (NCES 1992). Total public school enrollment, for example, rose about 5 percent from 1984 to 1990. As a result, schools are hiring teachers. At the beginning of both the 1987-88 and 1990-91 school years, an overwhelming majority of schools had job openings for teachers. These openings have not simply been replacements of teachers who left. The number of employed elementary and secondary teachers has steadily increased since the mid 1980s (NCES 1993). For example, from 1987-88 to 1990-91, the total population of elementary and secondary teachers jumped from 2,630,000 to 2,915,000.

Changes in teacher supply are more difficult to assess. This is because the quantity of potential teachers - the reserve pool - is large, diverse and probably, unknowable. Newly qualified teachers who have recently graduated from state-approved teacher training programs at colleges and universities are perhaps the most obvious and quantifiable source. But these only comprised about 20 percent of those hired in 1987-88 and 1990-91. There are numerous other sources of teachers for teaching jobs. For instance, over half of those teachers newly hired in both 1987-88 and 1990-91 were re-entrants — former teachers who were returning, or delayed entrants — trained teachers who did not seek a position immediately after their schooling. Indeed, data from NCES's Recent College Graduates Survey indicate that as many as 40 percent of newly trained and qualified teachers do not seek teaching positions immediately after their schooling (Gray et al. 1993; Frankel and Stowe 1990). Some delay their entrance into teaching and some never teach. All of these newly qualified teachers are potential members of the reserve pool.

The real supply issue is, of course, not the number of potential teachers but how many candidates are ready and willing to apply to teaching openings. In order to assess the supply of those ready and willing to teach, principals were asked if their schools had difficulty hiring suitable candidates to fill openings.

Of those schools reporting openings in 1987-88, principals in 44 percent of the public and 56 percent of the private schools reported they experienced difficulties in filling their vacancies. The situation was comparable in 1990-91. In fact, in 1990-91, 15 percent of principals reported that they had vacancies that were simply impossible to fill with a qualified teacher in the grade level to be taught. Despite these widespread difficulties in finding suitable candidates, however, there were very few teaching positions left unfilled or withdrawn because suitable candidates could not be found in the 1987-88 or 1990-91 school years in the U.S. Why?

In reality, schools often simply cannot and do not leave teaching positions unfilled, regardless of supply. There are two general strategies by which school officials can reduce shortfalls between the supply of and demand for particular kinds of teachers. One involves altering demand and the other involves altering supply (Haggstrom et al. 1988).

The first strategy is to decrease the demand for certain kinds of teachers by either eliminating positions, or shifting students to existing staff. This would result in increases in teachers' courseloads, school class sizes or pupil-teacher ratios. Data from SASS indicate this mechanism has not been used with frequency in recent years.

A second possible strategy is to increase or alter the supply of particular kinds of teachers. One version of this strategy increases supply by increasing salaries. The evidence for this is mixed. Average starting salaries for public school teachers have increased (in real dollars) over the past decade. But this only came after steady decreases (in real dollars) through the 1970s. In fact, the average starting salary for public school teachers in 1991

was about equal to that in 1972 (NCES 1992) (see Table 1). Moreover, the salaries of new college graduates who have become teachers in recent years have been considerably below that of new college graduates who chose most other occupations (Cahalan and Gray 1993) (see Table 2).

Table 1.--Average Starting Salary for Public School Teachers (in constant 1991 dollars): Selected Years 1972-1991

School Year Ending	
1972	$22,761
1974	$22,311
1976	$21,794
1978	$21,065
1980	$19,342
1982	$19,151
1984	$20,340
1986	$22,003
1988	$22,582
1989	$22,715
1990	$22,708
1991	$22,830

Table 2.--Average Annual Salaries of New Bachelor Degree Recipients in Teaching and Other Selected Occupations, 1990-91

Occupation	Salary	Difference
Teaching	$19,913[1]	—
Computer Science	30,419	$10,504
Math, Physical Sciences	26,040	6,125
Business/Management	25,961	6,046
Writers/Artists	22,353	2,438
Biologists	21,325	1,420
Communications	19,584	- 329
Public Affairs/Social Studies	19,227	- 686
All occupations	$23,632	$3,717

[1] Scheduled salary based on average contract length of 9.7 months.

Another version of the second strategy alters supply by filling a position with an underqualified candidate. This could be accomplished by shifting existing staff to areas of greater need; that is, assigning teachers trained in one field to teach in another. For example, social studies teachers could be assigned to teach mathematics courses. Alternatively, school officials could hire available teacher candidates, regardless of qualifications.

Data from SASS indicate that this supply strategy has been commonly used. For both public and private schools, among the most common methods of coping with difficulties in filling openings in 1987-88 and 1990-91 were to hire less qualified teachers, to assign other teachers and to use substitute teachers. For instance, in 1990-91, 50 percent of public school principals, who indicated they had difficulty filling openings, reported using substitute teachers as a remedy.

The widespread use of this latter supply strategy necessitates a shift in focus for teacher supply assessments. Rather than focus on whether or not there are or will be sufficient numbers of potential teachers, supply assessments need to examine the actual fit between the needs of schools and the qualifications of the teachers currently employed. That is, the focus shifts from assessing the adequacy of the quantity of potential teachers to assessing the adequacy of the quality of employed teachers. (also see Kennedy 1992; Darling-Hammond and Hudson 1990).

Assessing levels of teacher qualifications and quality, like assessing quantity, is a difficult and ambiguous task. How to define and measure a qualified teacher and quality teaching are subjects of great controversy (Haney et al. 1987; Ingersoll 1995a; Kennedy 1992). There is, however, almost universal agreement that one of the most important characteristics of a qualified teacher is training and preparation in the subject or field in which they are teaching. Research has shown moderate but consistent support for the reasonable proposition that subject knowledge is an important predictor of both teaching quality and student learning (for reviews of this research, see Shavelson et al. 1989; Darling-Hammond and Hudson 1990; Murnane and Raizen 1988). Knowledge of subject matter does not guarantee qualified teachers and quality teaching, but is a necessary prerequisite.

SASS data indicate that inadequacies in teacher quality were not due to a lack of basic training in subject matter. In 1990-91, for example, 99 percent of high school teachers employed in the United States held a bachelor's degree and 46 percent had obtained a graduate degree. The issue in question is the phenomenon of out-of-field teaching - teachers assigned to teach in fields for which they do not have adequate or appropriate training.

Of course, some degree of out-of-field teaching may be unavoidable and may not be an indicator of a shortage of qualified teaching candidates. School administrators charged with the task of offering programs in a range of required and elective subjects may often be forced to make spot decisions concerning the assignment of available faculty to an array of changing course offerings. But even low levels of out-of-field teaching are meaningful to teacher quality assessments. This is especially true for the case of high

schools and for the core academic fields. In high schools, teachers are divided by fields into departments; faculties are thus more specialized than in elementary schools, and therefore the differences between fields are more distinct and, perhaps, greater. Moreover, the level of mastery in different subjects is higher in high schools, and hence a clear case has been made by policy analysts and researchers that teachers ought to have adequate background in the subjects they teach (e.g., Shavelson et al. 1989; Murnane and Raizen 1988; Darling-Hammond and Hudson 1990). In the following section I focus on the levels of and variations in out-of-field teaching in high schools.

SASS data show, in fact, that substantial numbers of high school teachers were assigned to teach out of field or out of department in both 1987-88 and 1990-91. The data indicate that, while most high school teachers had a undergraduate or graduate major in their main teaching assignment field, large numbers of teachers were assigned to teach courses in additional fields for which they did not have a major or even a minor. In 1990-91, public high school teachers taught, on average, about 15 percent of their class schedules in fields for which they did not have a minor. This amounted to about one course in six. Private high school teachers taught far more of their classes without minimal qualifications. On average, for about one-quarter of their scheduled classes, they did not have at least a minor in the field. These percentages all substantially increase (sometimes double) if the standard is raised from a minor to a major in the field taught. As a result, substantial numbers of high school students were taught core academic classes by teachers without even minimal training in the field. These levels of out-of-field teaching, however, varied substantially by field.[3]

In 1990-91, fifteen percent of all high school English students — almost 2.25 million high school students in this country — were taught by teachers who did not have at least a college minor in English, language arts, journalism or communication. Twenty-one percent of all high school mathematics students, or over 2.5 million, were taught mathematics by teachers without at least a minor in mathematics or mathematics education. Eleven percent of high school students were taught science by teachers without at least a minor in any of the biological, physical or natural sciences or science education. Eleven percent of high school students were taught social studies by teachers without at least a minor in history, any of the social sciences or social studies education.

Out-of-field levels also varied considerably across different types of schools. Notably, public schools with a high proportion of poverty-level students (those with over 50 percent eligible for the federal free lunch program) had a higher proportion of students taught by out-of-field faculty in mathematics, science, and English than schools with less than 20 percent poverty-level students (Table 3).

Small schools (less than 300 students) in both the public and private sector tended to have relatively higher levels of out-of-field teaching. On one extreme were small private schools with 41 percent of mathematics students and 38 percent of English students out of field. On the other extreme were large public schools (600 or more students). Even these schools, however, had substantial levels of out-of-field teaching (Table 4).

Table 3.-- Percentage of public high school students enrolled in classes taught by teachers without at least a minor in the field, by poverty level of students*:1990-91

	Math	Science	Social Studies	English
Total Public	20.5	10.2	9.7	13.8
% Poverty Level				
Less than 20%	18.8	7.7	9.3	12.1
20-49%	23.4	12.6	11.1	16.5
50% or more	24.2	14.1	8.3	18.0

* Percent students eligible for federal free lunch program.

Table 4.-- Percentage of high school students enrolled in classes taught by teachers without at least a minor in the field, by school sector and size: 1990-91

	Math	Science	Social Studies	English
Total Overall	21.1	11.2	11.0	14.7
Total Public	20.5	10.2	9.7	13.8
Size				
Less than 300	26.6	16.7	14.2	16.2
300-599	20.8	11.1	11.4	17.7
600 or more	20.1	8.8	8.9	13.1
Total Private	25.9	19.5	22.2	22.7
Size				
Less than 300	41.4	28.7	34.3	37.7
300-599	23.2	8.0	19.1	15.2
600 or more	18.5	7.6	10.0	19.7

Conclusion

This paper addresses the ongoing debate as to whether there are shortages of teachers in the U.S. The analysis suggests that, in body counts alone, there are not shortages in the quantity of available school teachers in this country because the reserve pool of teachers is large and the supply of teachers is highly manipulable.

But, our analysis suggests there are, in fact, distinct inadequacies in how well schools are staffed. Schools have been able to fill available teaching positions, but only at the expense of minimal teacher qualifications. If one accepts the premise that adequate staffing requires high school teachers, for example, to hold at least a college minor in the fields which they teach, then this analysis suggests that many of the nation's high schools have not been adequately staffed. These inadequacies, however, were not an issue of teacher training. Most school teachers in the United States had completed a basic level of education and training. The inadequacies lay in the fit between teacher's fields of training and their teaching assignments. Many teachers were assigned to teach classes which did not match their education or training. As a result, there were substantial numbers of high school students taught by teachers who did not have even a college minor in the field taught. The result: teacher quality has been sacrificed for teacher quantity.

But these data do not establish, for example, to what extent out-of-field teaching is a short-term condition resulting from teacher shortages or to what extent it is a normal and ongoing practice in particular schools. It is quite likely that out-of-field assignments are both a chronic practice and also one that is increasingly utilized in shortage situations. Moreover, if out-of-field teaching is a remedy for difficulties in hiring, the problem is most likely not due to insufficient numbers of adequately trained teachers, but to the unwillingness of existing trained teacher candidates to seek positions. These issues warrant further investigation.

The extent to which schools employ underqualified teachers has, of course, important implications not only for the shortage debate, but for contemporary education reform efforts seeking to improve teacher and teaching quality. Such efforts have sought to raise the standards, increase the training and upgrade the work of teachers. From this viewpoint, widespread assignment of teachers to teach subjects for which they are not trained is an example of an inappropriate utilization of costly resources. Moreover, the cross school variations in the utilization or under-utilization of these human resources, illustrated in Tables 3 and 4, have implications for several streams of current education research and reform.

Equity is one of the central concerns of contemporary educational researchers and policymakers (e.g., National Commission on Excellence in Education 1983). Concern centers around disparities in the resources and quality of schooling provided to different student subgroups. This analysis draws attention to differences in the distribution of one such resource—qualified teachers. These data suggest that poorer student populations more often receive less qualified teachers. This raises questions about the impact of out-of-field teaching levels on the achievement of students from such schools.

Private/public school differences is another central theme in much current education research. In particular, analysts have focused on the widespread differences in the ways public and private schools are organized and operated (e.g. Coleman and Hoffer 1987). This analysis draws attention to distinct differences in an important but overlooked aspect of school organization—the management and utilization of teachers as professionals. These data suggest many private schools are characterized by high levels of underqualified teaching. This raises questions about differences in the degree of teacher professionalism between public and private schools.

Finally, the state of mathematics and science educational quality and achievement in the United States is another important topic in contemporary education research. There is a growing constituency who have looked to mathematics and science education as a key example of what is wrong with the American education system, and hence, a target for education reform (Darling-Hammond and Hudson 1990; Murnane and Raizen 1988). This analysis draws attention to the especially high levels of out-of-field teaching in mathematics. This raises questions concerning the distinct variations in levels of out-of-field teaching among fields and the impact of teacher background on student achievement.

References

Boe, E. & Gilford, D. (1992). Teacher supply, demand and quality. Washington, DC: National Academy Press.

Cahalan, M. & Gray, L. (1993). Occupational and Educational Outcomes of Recent College Graduates 1 Year After Graduation: 1991. Washington, DC: US Department of Education, National Center for Education Statistics.

Choy, S., Henke, R., Alt, M., Medrich, E. & Bobbitt, S. (1993). Schools and Staffing in the U.S: A Statistical Profile, 1990-91. Washington, DC: US Department of Education, National Center for Education Statistics.

Coleman, J. & Hoffer, T. (1987). Public and Private Schools: The Impact of Communities. New York: Basic.

Darling-Hammond, L. (1984). Beyond the commission reports: The coming crisis in teaching. Santa Monica, CA: Rand Corporation.

Darling-Hammond, L., Hudson, L. (1990). "Pre-college Science and Mathematics Teachers: Supply, Demand and Quality. Review of Research in Education. Washington, DC: American Educational Research Association.

Feistritzer, E. (1986). Teacher Crisis: Myth or reality? Washington, D.C.: National Center for Education Information

Frankel, M. & Stowe, P. (1990). New teachers in the job market, 1987 update. Washington, DC: US Department of Education, National Center for Education Statistics.

Good, T. & Hinkel, G., (1983). Teacher shortage in science and mathematics: myths, realities and research. Washington, DC: National Institute of Education.

Gray, L, Cahalan, M., Hein, S., Litman, C., Severynse, J., Warren, S., Wisan, G., Stowe, P. (1993). New teachers in the job market, 1991 update. Washington, DC: US Department of Education, National Center for Education Statistics.

Grissmer, D. & Kirby, S. (1987). Teacher attrition: the uphill climb to staff the nation's schools. Santa Monica, CA: Rand Corporation.

Grissmer, D. & Kirby, S. (1992). Patterns of attrition among Indiana teachers, 1965- 1987. Santa Monica, CA: Rand Corporation.

Haggstrom, G. W., Darling-Hammond, L., & Grissmer, D. (1988) Assessing teacher supply and demand. Santa Monica CA: Rand Corporation.

Haney, W., Madus, G. & Kreitzer, A. (1987). Charms talismanic: Testing teachers for the improvement of American education. Review of Research in Education. (pp.169-238). Washington, DC: American Educational Research Association.

Ingersoll, R. (1995a). National assessments of teacher quality. Washington, DC: US Department of Education, National Center for Education Statistics.

-----. (1995b). Teacher Supply and Teacher Turnover: 1990-1991. Washington, DC: US Department of Education, National Center for Education Statistics.

Kaufman, Steven, Huang, H., (1993). 1990-91 Schools and Staffing Survey: Sample Design and Estimation. Washington, DC: US Department of Education, National Center for Education Statistics.

Kennedy, M. 1992. "The problem of improving teacher quality while balancing supply and demand." pp. 63-126 in Boe, E. & Gilford, D., eds. Teacher supply, demand and quality. Washington, DC: National Academy Press.

Murnane, R., Singer, J., Willett. J., Kemple, J., Olsen, R. (1992). Who will teach?: Policies that matter. Cambridge, Ma.: Harvard University Press.

Murnane, R. & Raizen, S. (1988). eds. Improving indicators of the quality of science and mathematics education in grades k-12. Washington, DC: National Academy Press.

National Academy of Sciences. (1987). Toward understanding teacher supply and demand. Washington, DC: National Academy Press.

National Center for Education Statistics. 1992 The Condition of Education . Washington, DC. US Department of Education.

National Center for Education Statistics. (1993). The Digest of Education Statistics . Washington, DC. US Department of Education.

National Commission on Excellence in Education. (1983). A Nation at Risk: The Imperative for Educational Reform. Washington, DC: Govt. Printing Office.

Shavelson, R., McDonnell, L. & Oakes, J. (1989). Indicators for monitoring mathematics and science education. Santa Monica, CA: Rand Corporation.

Endnotes

[1] This paper is drawn from a larger report on teacher supply, demand and quality sponsored by NCES (contract number RN93140001). This paper does not constitute an official NCES publication. The views expressed here are solely those of the author. A more detailed and comprehensive analysis is contained in the official report, see Ingersoll (1995b).

[2] SASS data tapes, survey questionnaires and user's manuals are available from NCES, U.S. Department of Education, 555 New Jersey Ave., Washington, D.C. 20208-5641. For information concerning the survey design and sample estimation of SASS see Kaufman and Huang (1993). For an extensive report, summarizing the items used in this investigation and providing an overview of the entire survey see Choy et al. (1993).

[3] Out-of-field teaching can be empirically measured in a number of ways. Here, I focus on (1.) a minimal level of (2.) substantive training in (3.) broadly defined fields. Thus: (1.) At least a minor in the field is defined as adequate. (2.) The focus is on substantive training; I do not focus on formal training in teaching methods and pedagogy i.e. certification. (3.) Fields are defined parallel to conventional departmental divisions in high schools. That is, fields include all within-department disciplines. Hence, for example, a minor in any of the natural, physical or biological sciences is considered adequate training to teach any science course. See Ingersoll (1995b) for a detailed discussion of a range of out-of-field teaching measures.

BEST COPY AVAILABLE